

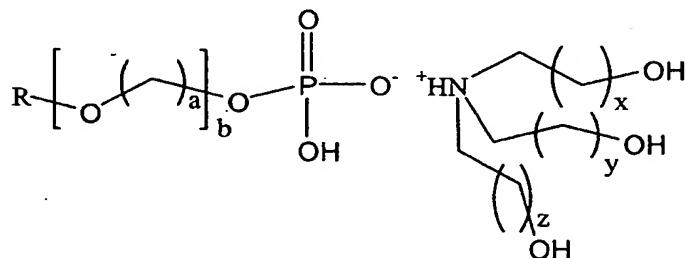
What is Claimed is:

1. A cleaning solution for photoresist patterns comprising:

H₂O as a solvent; and

5 a compound represented by following Formula 1 as a surfactant:

Formula 1



wherein

R is C₂-C₂₀ alkyl or C₆-C₂₅ alkyl aryl;

10 x, y and z individually are an integer ranging from 0 to 10;

a is 2 or 3; and

b is an integer ranging from 2 to 50.

2. The cleaning solution according to claim 1, wherein the b is an

15 integer ranging from 6 to 11.

3. The cleaning solution according to claim 1, further comprising

an alcohol.

20 4. The cleaning solution according to claim 1, wherein the

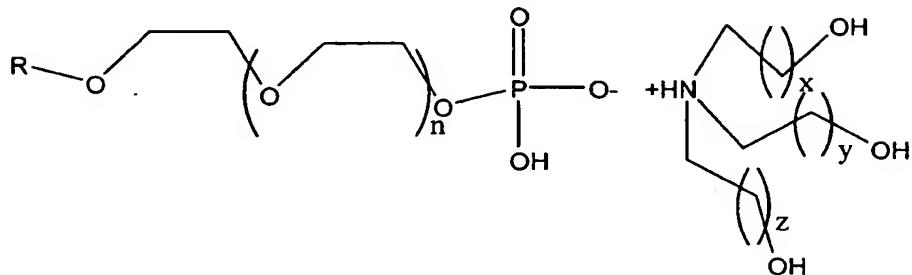
compound of Formula 1 is present in an amount ranging from 0.001 to 2 wt% based on the total weight of said solution.

5. The cleaning solution according to claim 3 wherein the alcohol

25 is present in an amount ranging from 0 to 20 wt% based on the total weight of said solution.

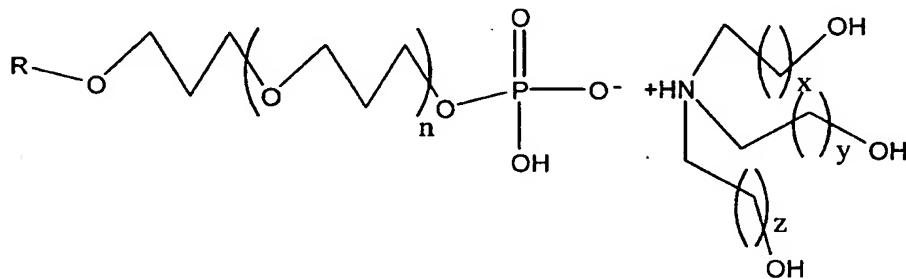
6. The cleaning solution according to claim 1, wherein the compound of Formula 1 is represented by Formula 2 or Formula 3:

Formula 2



5

Formula 3



wherein

R is $\text{C}_2\text{-C}_{20}$ alkyl or $\text{C}_6\text{-C}_{25}$ alkyl aryl;

x, y and z individually are an integer ranging from 0 to 10; and

10 n is an integer ranging from 1 to 49.

7. The cleaning solution according to claim 6, wherein the compound of Formula 2 is present in an amount ranging from 0.001 to 2 wt% based on the total weight of said solution, and the alcohol is present in an amount ranging 15 from 0 to 20 wt% based on the total weight of said solution.

8. The cleaning solution according to claim 6, wherein the compound of Formula 3 is present in an amount ranging from 0.001 to 2 wt% based on the total weight of said solution, and the alcohol is present in an amount ranging 20 from 0 to 10 wt% based on the total weight of said solution.

9. The cleaning solution according to claim 7, wherein the compound of Formula 2 is present in an amount ranging from 0.01 to 1 wt% based on the total weight of said solution, and the alcohol is present in an amount ranging from 0.01 to 10 wt% based on the total weight of said solution.

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10. The cleaning solution according to claim 8, wherein the compound of Formula 3 is present in an amount ranging from 0.001 to 1 wt% based on the total weight of said solution, and the alcohol is present in an amount ranging from 0.001 to 5 wt% based on the total weight of said solution.

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11. The cleaning solution according to claim 6, wherein R is selected from the group consisting of octyl, octyl phenyl, nonyl, nonyl phenyl, decyl, decyl phenyl, undecyl, undecyl phenyl, dodecyl and dodecyl phenyl, and n is an integer ranging from 5 to 10.

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12. The cleaning solution according to claim 3, wherein the alcohol is selected from the group consisting of C₁-C₁₀ alkyl alcohol, C₁-C₁₀ alkoxyalkyl alcohol, and mixtures thereof.

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13. The cleaning solution according to claim 12, wherein the C₁-C₁₀ alkyl alcohol is selected from the group consisting of methanol, ethanol, propanol, isopropanol, n-butanol, sec-butanol, t-butanol, 1-pentanol, 2-pentanol, 3-pentanol, 2,2-dimethyl-1-propanol and mixtures thereof.

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14. The cleaning solution according to claim 12, wherein the C₁-C₁₀ alkoxyalkyl alcohol is selected from the group consisting of 2-methoxyethanol, 2-(2-methoxyethoxy)ethanol, 1-methoxy-2-propanol, 3-methoxy-1,2-propandiol and mixtures thereof.

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15. The cleaning solution according to claim 1, wherein the solution is selected from the group consisting of
mixture comprising the compound of Formula 2 as a surfactant
wherein R is nonyl; x, y and z are 1, respectively; and n is 7, methanol as an alcohol
and water as a solvent;

5 mixture comprising the compound of Formula 2 as a surfactant
wherein R is octyl; x, y and z are 1, respectively; and n is 7, methanol as an alcohol
and water as a solvent;

10 mixture comprising the compound of Formula 2 as a surfactant
5 wherein R is dodecyl; x, y and z are 0, respectively; and n is 7, isopropanol as an
alcohol and water as a solvent;

15 mixture comprising the compound of Formula 2 as a surfactant
wherein R is octyl phenyl; x, y and z are 1, respectively; and n is 3, isopropanol as an
alcohol and water as a solvent;

20 mixture comprising the compound of Formula 3 as a surfactant
wherein R is nonyl; x, y and z are 1, respectively; and n is 7, methanol as an alcohol
and water as a solvent;

25 mixture comprising the compound of Formula 3 as a surfactant
wherein R is octyl; x, y and z are 1, respectively; and n is 7, methanol as an alcohol
15 and water as a solvent;

30 mixture comprising the compound of Formula 3 as a surfactant
wherein R is dodecyl; x, y and z are 0, respectively; and n is 7, isopropanol as an
alcohol and water as a solvent; and

35 mixture comprising the compound of Formula 3 as a surfactant
20 wherein R is octyl phenyl; x, y and z are 1, respectively; and n is 3, isopropanol as an
alcohol and water as a solvent.

16. The cleaning solution according to claim 15, wherein the
surfactant of Formula 2 is present in an amount ranging from 0.001 to 2 wt% based on
25 the total weight of said mixture, and the alcohol is present in an amount ranging from
0 to 20 wt% based on the total weight of said mixture.

17. The cleaning solution according to claim 15, wherein the
surfactant of Formula 3 is present in an amount ranging from 0.001 to 2 wt% based on
30 the total weight of said mixture, and the alcohol is present in an amount ranging from
0 to 10 wt% based on the total weight of said mixture.

18. The cleaning solution according to claim 16, wherein the surfactant of Formula 2 is present in an amount ranging from 0.01 to 1 wt% based on the total weight of said mixture, and the alcohol is present in an amount ranging from 0.01 to 10 wt% based on the total weight of said mixture.

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19. The cleaning solution according to claim 17, wherein the surfactant of Formula 3 is present in an amount ranging from 0.001 to 1 wt% based on the total weight of said mixture, and the alcohol is present in an amount ranging from 0.001 to 5 wt% based on the total weight of said mixture.

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20. A method for forming a photoresist pattern, comprising:

15 (a) preparing a semiconductor substrate on which an underlying layer is formed;

(b) coating a photoresist on the underlying layer to form a photoresist

film;

(c) exposing the photoresist film to light;

(d) developing the exposed photoresist film; and

(e) cleaning the resulting structure using the cleaning solution of claim

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21. The method according to claim 20, further comprising soft baking step before part (c) or post baking step after part (c).

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22. The method according to claim 20, wherein the source of the light is selected from the group consisting of KrF (248 nm), ArF (193 nm), VUV (157 nm), EUV (13 nm), E-beam, X-ray and ion-beam.

23. A semiconductor device manufactured by the method of claim

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